HPS valves (mixer)

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1 General

In case of repair, replace a single HPS valve (O2 or AIR), or, if necessary, both HPS valves (mixer).

1.1 Testing the HPS valves (mixer)

Test the HPS valves (mixer) using the “External service mode with personal computer”, see chapter “Repair Instructions”.

1.2 Troubleshooting

Mixer problems, e.g. “fiO2”, “VT”, or “MV” deviations, could result from the following faults:

- “fiO2” or “flow” measurement is faulty
- the supply pressure sensor for AIR or O2 is faulty
- the HPS valve for AIR or O2 is faulty
- the HPS controller for AIR or O2 is faulty

In the event of a fiO2 deviation

Carry out an O2 calibration and check O2 measurement at a set value of 21 vol.% and 100 vol.%, refer also to the PMS procedure.

In the event of VT or MV deviations

Check whether the sealing between the patient system and the flow sensor is mounted correctly; correct if necessary.

Testing the supply pressure sensors

Check the supply pressure sensors as described in the PMS procedure.

Testing the volume metering/flow measurement

Check the volume metering/flow measurement as described in the PMS procedure.

If a test value is not met with one supply gas (AIR or O2), interchange the two HPSV Controller PCBs.

If the error still occurs for a specific gas type, the respective HPS valve is faulty.

If the error switches to the other gas type, then the respective HPSV Controller PCB is faulty.

1.3 Replacing the HPS valves (mixer)

1 Switch off the device.

2 Unplug the power plug of the device from the socket-outlet.

3 Disconnect the compressed-gas connectors of the device from the compressed-gas supply.

4 Remove the control unit from the device.

Electrostatic discharge may damage electrostatic sensitive devices. When handling electrostatic sensitive devices, use a static-dissipative mat and a static dissipative wrist strap.

5 Create ESD conditions.

6 Fold up the electronic assembly, see chapter “Repair Instructions”, section “Opening the device”.

7 Remove the screws (Fig. 1/1) from the cover plates (Fig. 1/2).

8 Put the cover plates aside.

9 Disconnect the connectors of the supply pressure sensors from the connections.

10 Remove the screws (Fig. 1/3).

11 Remove both supply pressure sensors and the sealings, and secure them to the new HPS valves (mixer) with the screws (Fig. 1/3).

12 Plug the connectors of the supply pressure sensors onto the connections of the new HPS valves (mixer).

13 Secure the cover plates (Fig. 1/2) to the new HPS valves (mixer) with the screws (Fig. 1/1).

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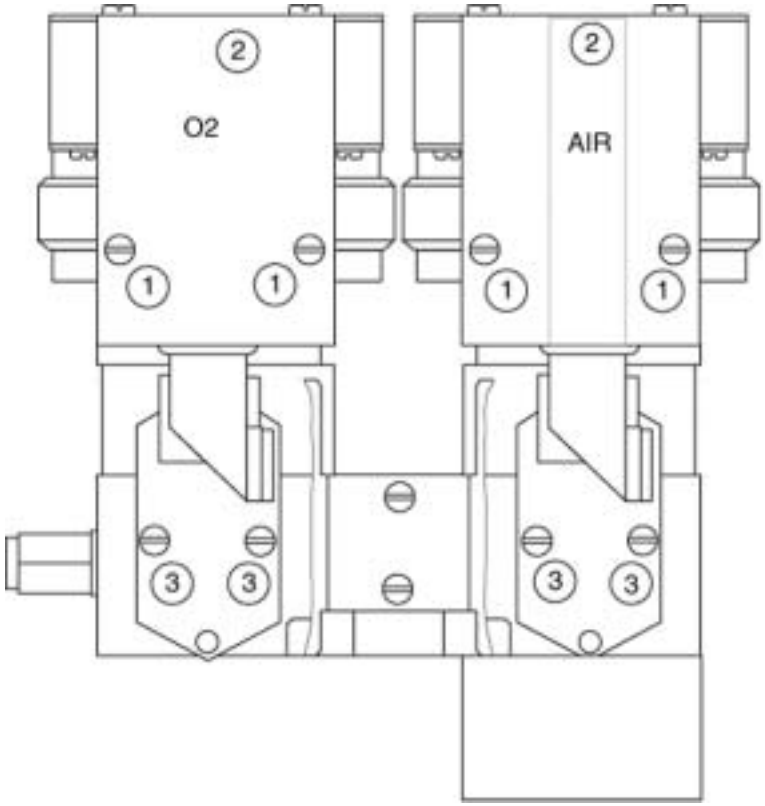

Fig. 1 HPS valves (mixer)

14 Loosen the screw (Fig. 2/1) of the cover and put the cover aside.

Fig. 2 Cover

15 Disconnect the plug-in connector of the O2 cell (Fig. 3) from the Pneumatic Controller PCB.

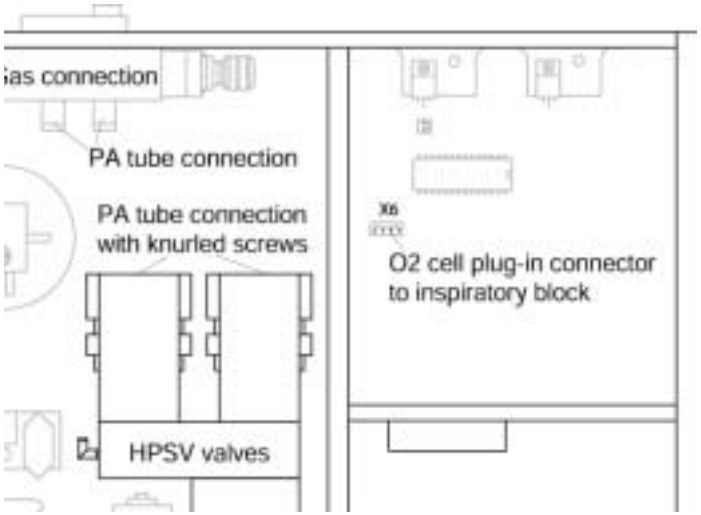

Fig. 3 Detail of the pneumatics

16 Disconnect the inspiratory socket from the inspiratory block.

17 Hold the inspiratory block and unscrew the inspiratory block screw (Fig. 4/1).

18 Pull the lead with the plug-in connector of the O2 cell slightly toward the inspiratory block, and carefully place the inspiratory block onto pneumatic assembly.

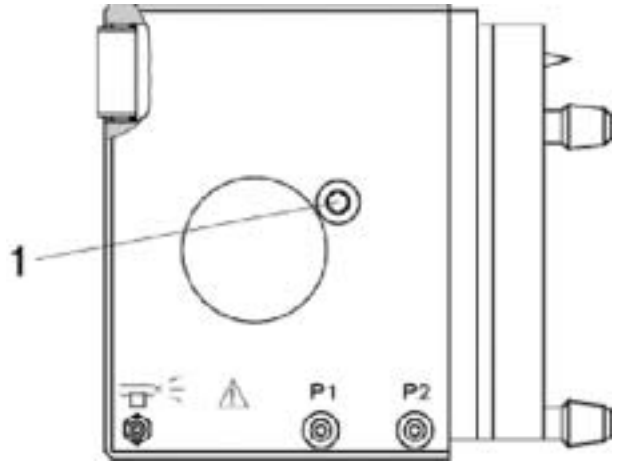

Fig. 4 Inspiratory block

19 Push in the locking rings of the PA tube connection sockets (Fig. 5/1), and pull the PA tubes out of the gas connection block.

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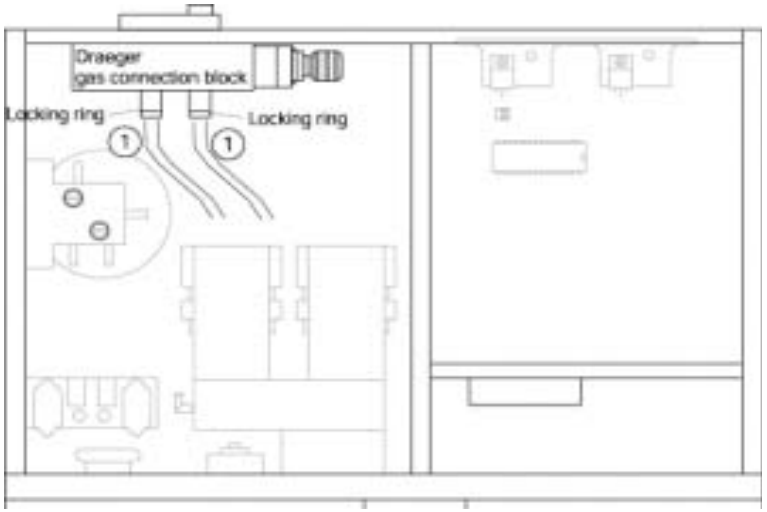

Fig. 5 PA tubes on the gas connection block

20 Remove the patient system.

21 Remove the flow sensor (Fig. 6/1) from its mount.

Sealings and a tension spring could be lost while removing the patient system in the next work step. Remove the patient system screw carefully making sure not to lose any sealings or the tension spring.

22 Remove the screws (Fig. 6/2) from the patient system and carefully place the patient system on the pneumatic assembly.

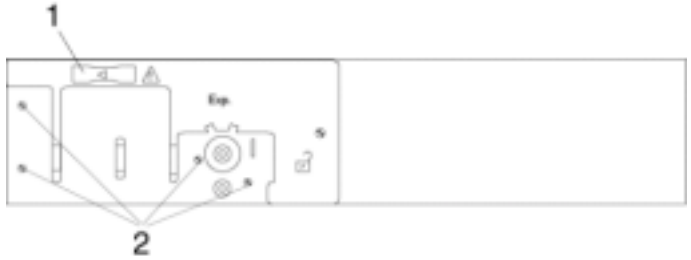

Fig. 6 Patient system

23 Remove the screws (Fig. 7/1) from the front of the pneumatic assembly.

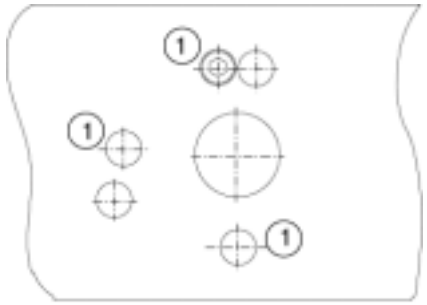

Fig. 7 Attachment of the HPS valve (mixer) to the front

24 Remove faulty HPS valves (mixer) from the device.

25 Push in the locking rings of the PA tube connectors and, at the same time, pull the PA tubes from the faulty HPS valves (mixer).

Faulty HPS valves (mixer) are special waste. Dispose of the HPS valves (mixer) according to applicable waste disposal regulations.

26 Dispose of the HPS valves (mixer) according to applicable waste disposal regulations.

The HPS valve is electrically insulated from the housing. It must not be installed such that it touches the housing, e.g. the bottom plate (protection class BF!).

Kinked and/or squeezed hoses adversely affect the function of the HPS valve. Do not kink or squeeze hoses during assembly.

27 Place the HPS valves (mixer) into the device and secure them to the device using the screws (Fig. 8/1).

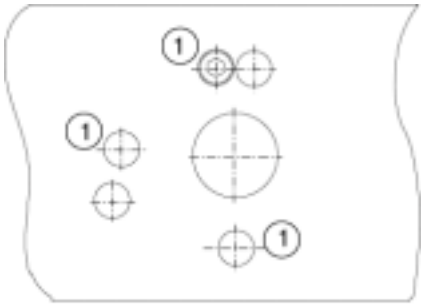

Fig. 8 Attachment of the HPS valve (mixer) to the front

28 The PA tubes are color-coded; plug the respective PA tube into the matching connection socket of the HPS valve (mixer) (Note: yellow PA tube = AIR; blue PA tube = O2).

29 Secure the knurled screws of the plug-in connection (Fig. 9/PA tube connection with knurled screws) using screw stop varnish.

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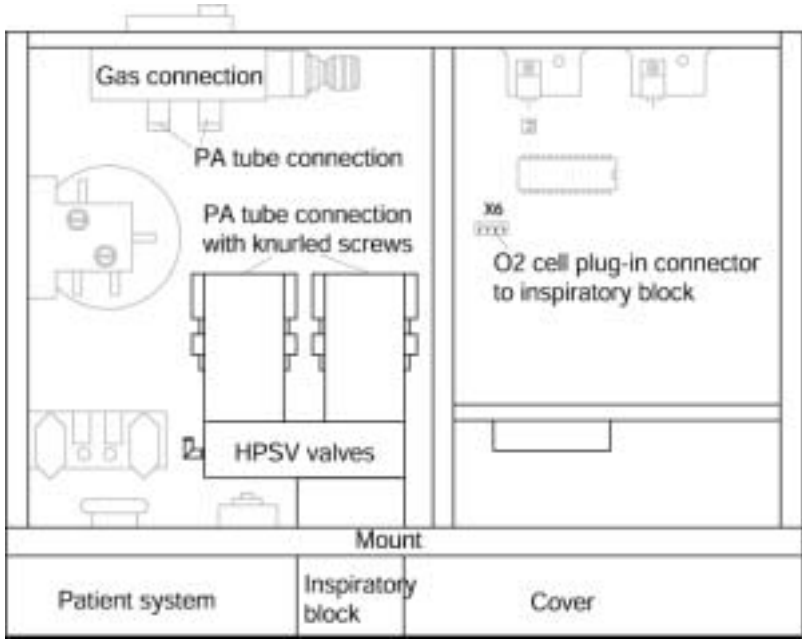

Fig. 9 HPS valves (mixer)

30 Plug the PA tubes into the connection socket of the gas connection block.

31 Check that the PA tubes are locked in place securely by carefully pulling at them without using too much force.

32 Check that all sealings and the tension spring are in place, then secure the patient system to the device making sure that no leads or hoses are squeezed or damaged.

33 Install the inspiratory block on the device.

34 Connect the plug-in connector of the O2 cell to the “X6” connector, see Fig. 10.

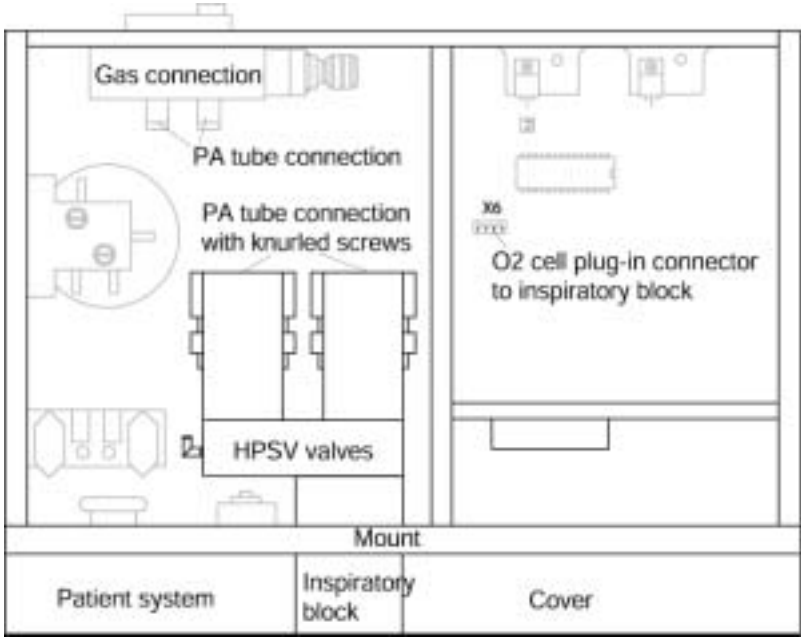

Fig. 10 HPS valves (mixer)

35 Record the registration numbers of the new HPS valves (mixer) on the respective accompanying documents.

36 Fold the electronic assembly down and secure it to the basic device using the screws.

37 Connect the compressed-gas hoses to the central supply system.

38 Plug the power plug into the mains socket-outlet.

39 Switch the device on.

40 Perform “electrical safety tests” and “function tests” as described in the PMS procedure. For the USA and Canada: test according to CAN/CSA-22.2 No. 601.1-M90.

1.4 Replacing the HPS valve (O2)

The description how to replace the HPS valve (O2) is similar to the HPS valve (AIR) replacement description, see section 1.5 Replacing the HPS valve (AIR).

1.5 Replacing the HPS valve (AIR)

1 Switch off the device.

2 Unplug the power plug of the device from the socket-outlet.

3 Disconnect the compressed-gas connectors of the device from the compressed-gas supply.

Electrostatic discharge may damage electrostatic sensitive devices. When handling electrostatic sensitive devices, use a static-dissipative mat and a static dissipative wrist strap.

4 Create ESD conditions.

5 Fold up the electronic assembly, see chapter Repair Instructions, section “Opening the device”.

6 Push in the locking ring (Fig. 11/1) of the PA tube connection socket at the HPS valve (AIR) and, at the same time, pull the PA tube (Fig. 11/2) out of the HPS valve.

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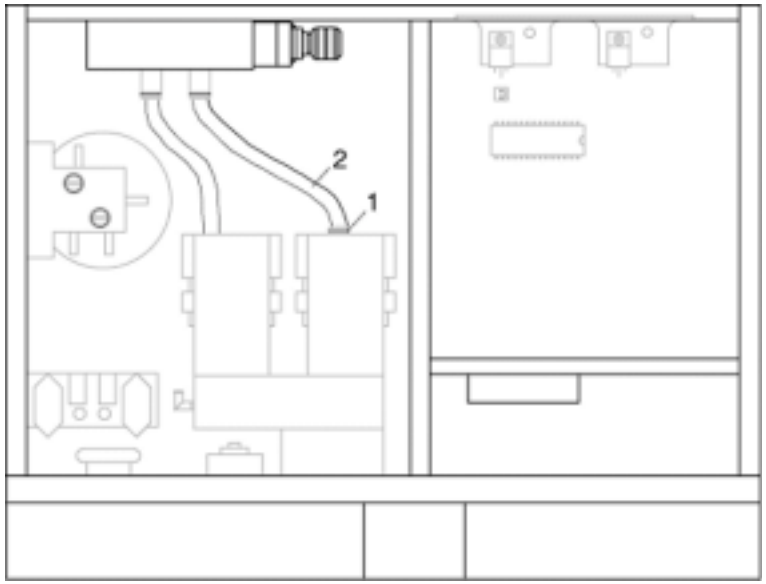

Fig. 11 Inside view of the of the pneumatic assembly

7 Remove the screws (Fig. 12/1) from the cover plate (Fig. 12/3).

8 Put the cover plate aside.

9 Disconnect the connector of the supply pressure sensor from the connection.

10 Remove the screws (Fig. 12/2).

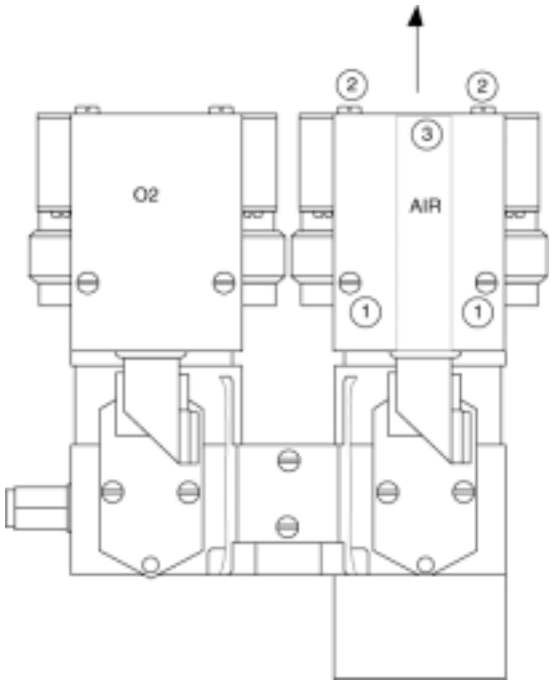

Fig. 12 HPS valves (mixer)

11 Remove the faulty HPS valve “AIR” from the valve block.

Faulty HPS valves are special waste. Dispose of a faulty HPS valve according to applicable waste disposal regulations.

12 Dispose of the faulty HPS valve according to applicable waste disposal regulations.

13 Record the registration number of the new HPS valve (AIR) on the respective accompanying documents.

Dirt or other particles can adversely affect the function of the HPS valves. Make sure no dirt or other particles enter into the HPS valve.

14 Apply a small amount of distilled water on the two O-rings (Fig. 13/1) of the new HPS valve.

15 Push the new HPS valve into the HPS valve block making sure the mounting position is correct (Fig. 13).

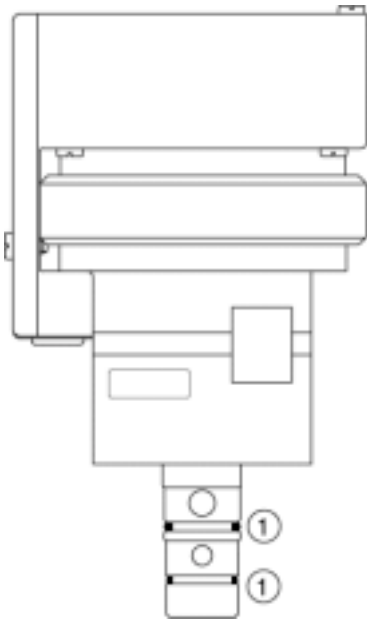

Fig. 13 HPS valve

16 Secure the HPS valve to the HPS valve block with the screws (Fig. 14/2).

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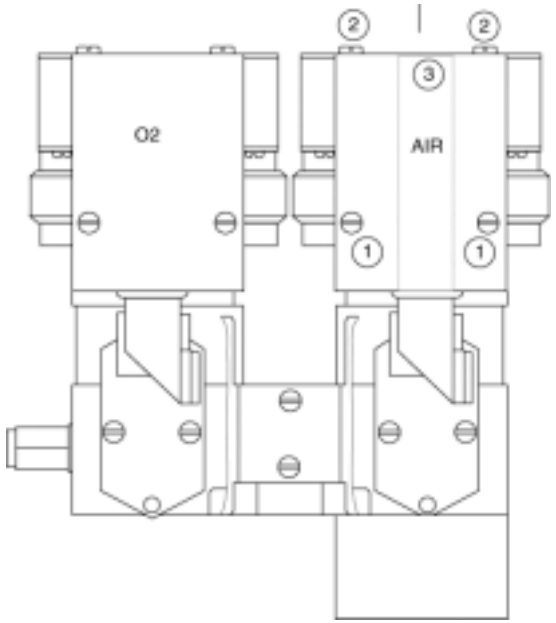

Fig. 14 HPS valves (mixer)

17 Plug the supply pressure sensor connector onto the HPS valve.

18 Secure the cover plate (Fig. 14/3) to the HPS valve with the screws (Fig. 14/1).

19 Push in the locking ring at the new HPS valve and, at the same time, insert the PA tube into the HPS valve.

20 Carefully pull at the PA tube to check that it is locked securely in the locking ring. The PA tube should not come out any more.

21 Push in the locking ring of the PA tube connection socket at the gas connection block, and insert the PA tube into the gas connection block.

22 Carefully pull at the PA tube to check that it is locked securely in the locking ring. The PA tube should not come out any more.

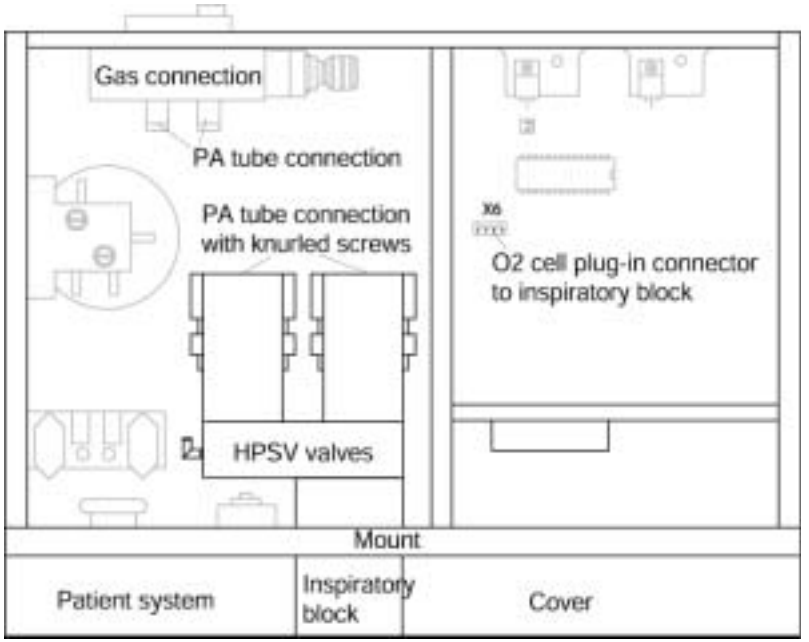

Fig. 15 HPS valves (mixer)

23 Fold the electronic assembly down and secure it to the basic unit using the screws.

24 Connect the compressed-gas hoses to the central supply system.

25 Plug the power plug of the device into the socket-outlet.

26 Switch the device on.

27 Perform “electrical safety tests” and “function tests” as described in the PMS procedure. For the USA and Canada: test according to CAN/CSA-22.2 No. 601.1-M90.

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